

CLAIMS

What is claimed is:

1. An internal combustion cylinder assembly comprising:

a cylinder having a combustion chamber at an end thereof;

a piston disposed slidably within said cylinder, said piston having a top dead center position substantially proximate to said combustion chamber and a bottom dead center position substantially distal from said combustion chamber;

an intake runner connected communicably to said combustion chamber via an intake valve, said intake runner providing a working fluid to said combustion chamber while said intake valve is substantially open and said piston moves from said top dead center position to said bottom dead center position;

a pre-combustion chamber connected communicably to said combustion chamber via a Suder valve, said combustion chamber conveying a portion of said working fluid to said pre-combustion chamber while said Suder valve is substantially open;

wherein said Suder valve opens substantially simultaneously with said intake valve, said Suder valve remains substantially open while said piston moves from said top dead center position to said bottom dead center position during an intake stroke, and said Suder valve closes substantially while said piston is returning to said top dead center position during a compression stroke.

2. The internal combustion cylinder assembly of claim 1, comprising further:

a fuel injector disposed in said cylinder head to admit fuel to said combustion chamber, said fuel injector admitting a pilot quantity of fuel substantially before said piston returns to said top dead center during said compression stroke.

3. The internal combustion cylinder assembly of claim 1, wherein said Suder valve closes substantially between a crankshaft angle of about 110 degrees before said top dead center position and 50 degrees before said top dead center position during said compression stroke.

4. The internal combustion cylinder assembly of claim 1, wherein said Suder valve is selected from the group consisting of:

- a gate valve,
- a rotary valve,
- a slide valve,
- a spool valve,
- a sleeve valve, and
- a poppet valve.

5. The internal combustion cylinder assembly of claim 1, wherein said Suder valve is actuated by an actuator selected from the group consisting of:

- a cam lobe,
- an hydraulic actuator,
- a piezoelectric motor,
- a voice coil, and
- a solenoid.

6. The internal combustion cylinder assembly of claim 1, wherein a volume of said pre-combustion chamber is about one-third of a volume of said combustion chamber when said piston is at said top dead center position.

7. The internal combustion cylinder assembly of claim 1, comprising further:
a transducer monitoring a pressure in said combustion chamber; and

wherein a closing of said Suder valve is retarded if said pressure is greater than a predetermined pressure.

8. The internal combustion cylinder assembly of claim 7, wherein said predetermined pressure indicates an onset of combustion.

9. The internal combustion cylinder assembly of claim 1, wherein said working fluid in said pre-combustion chamber is substantially compressed after said Suder valve closes substantially while said piston is returning to said top dead center position during a compression stroke.

10. The internal combustion cylinder assembly of claim 9, wherein a fuel in said working fluid in said pre-combustion chamber auto-ignites after said Suder valve closes substantially while said piston is returning to said top dead center position during a compression stroke.

11. A method of controlling combustion in an internal combustion engine comprising:

connecting a pre-combustion chamber to a combustion chamber;

drawing a working fluid into a cylinder through an intake runner in said combustion chamber;

closing said intake runner with an intake valve;

compressing said working fluid in said combustion chamber and said pre-combustion chamber;

adding a pilot quantity of fuel to said working fluid while said working fluid is being compressed;

disconnecting said pre-combustion chamber from said combustion chamber before said compression is complete;

compressing said working fluid further in said combustion chamber; and
igniting said fuel with heat generated by compressing said working fluid.

12. The method of controlling combustion in an internal combustion engine of claim 11, comprising further:

monitoring a pressure in said combustion chamber; and
retarding disconnecting said pre-combustion chamber from said combustion chamber if said pressure is greater than a predetermined pressure.

13. The method of controlling combustion in an internal combustion engine of claim 11, comprising further:

compressing said working fluid further in said pre-combustion chamber.

14. The method of controlling combustion in an internal combustion engine of claim 13, comprising further:

igniting fuel in said working fluid in said pre-combustion chamber.

15. A system for controlling combustion in an internal combustion engine comprising:

means for connecting a pre-combustion chamber to a combustion chamber;
means for drawing a working fluid into a cylinder through an intake runner in said combustion chamber;

means for closing said intake runner with an intake valve;

means for compressing said working fluid in said combustion chamber and said pre-combustion chamber;

means for adding a pilot quantity of fuel to said working fluid while said working fluid is being compressed;

means for disconnecting said pre-combustion chamber from said combustion chamber before said compression is complete;

means for compressing said working fluid further in said combustion chamber; and

means for igniting said fuel with heat generated by compressing said working fluid.

16. The system for controlling combustion in an internal combustion engine of claim 15, comprising further:

means for monitoring a pressure in said combustion chamber; and

means for retarding disconnecting said pre-combustion chamber from said combustion chamber if said pressure is greater than a predetermined pressure.

17. The system for controlling combustion in an internal combustion engine of claim 15, comprising further:

means for compressing said working fluid further in said pre-combustion chamber.